School Curriculum and Standards Authority

MARINE AND MARITIME STUDIES

Marine and Maritime Studies: Accredited December 2010 (updated June 2012)
For teaching 2013, examined in 2013

IMPORTANT INFORMATION

Syllabus review

Once a course syllabus has been accredited by the School Curriculum and Standards Authority, the implementation of that syllabus will be monitored by the Course Advisory Committee. This committee can advise the Board of the Authority about any need for syllabus review. Syllabus change deemed to be minor requires schools to be notified of the change at least six months before implementation. Major syllabus change requires schools to be notified 18 months before implementation. Formal processes of syllabus review and requisite reaccreditation will apply.

Other sources of information

The Western Australian Certificate of Education (WACE) Manual contains essential information on assessment, moderation and examinations that need to be read in conjunction with this course.

The School Curriculum and Standards Authority website www.scsa.wa.edu.au and extranet provides support materials including sample programs, course outlines, assessment outlines, assessment tasks with marking keys, past WACE examinations with marking keys, grade descriptions with annotated student work samples and standards guides.

WACE providers

Throughout this document the term 'school' is intended to include both schools and other WACE providers.

Currency

This document may be subject to minor updates. Users who download and print copies of this document are responsible for checking for updates. Advice about any changes made to the document is provided through the Authority communication processes.

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Rationale

A significant relationship between the marine environment and humans has existed throughout history. Australia is an island nation, with Western Australia's mainland and islands having approximately twenty one thousand kilometres of coastline. It is therefore relevant to Western Australians to study the sea and how people interact with it. The Marine and Maritime Studies course provides students with the opportunity to understand and explore this relationship and the importance of developing and maintaining a sustainable future.

The Marine and Maritime Studies course draws from a diverse range of disciplines, including science, technology and the humanities. It provides students with opportunities to engage in unique theoretical and practical learning experiences, and to equip them with a broad range of skills and knowledge.

Marine and Maritime Studies provides opportunities for students to apply theoretical knowledge through practical activities with a focus on active learning experiences both within and outside of the classroom.

Students are given the opportunity to develop responsible and competent boat-handling and navigation skills under power and/or sail and in doing so demonstrate an understanding of nautical concepts. They develop knowledge of the properties inherent in seaworthy craft and the basics of good boat design, construction and maintenance. Students will also be provided with the opportunity to develop personal water–based skills (swimming/ snorkelling/scuba) to allow them to engage directly with the marine environment.

Students investigate oceanography concepts to develop a strong understanding of the interdependence between elements of the marine environment, conduct research into the safe and sustainable management of the oceans' resources for conservation and commercialism and also are introduced to the world of maritime archaeology.

The course will provide students with a solid foundation of skills and knowledge suitable for a wide range of vocational or recreational pathways in boating (commercial and recreational), scuba, vessel design and construction (maritime engineering), resource management, maritime archaeology or marine science.

Course outcomes

The Marine and Maritime Studies course is designed to facilitate the achievement of three outcomes.

Outcome 1: Marine and maritime knowledge
Students develop an understanding of marine and maritime related knowledge.
In achieving this outcome, students gain knowledge of:

- oceanographic concepts
- aspects of marine life and the relationships between components of the underwater world
- maritime engineering concepts
- nautical concepts
- Western Australian maritime history.

Outcome 2: Marine and maritime skills
Students develop marine and maritime related skills.
In achieving this outcome, students develop:

- seamanship skills
- nautical skills
- water–based skills (swimming/snorkelling/scuba)
- scientific investigation and research skills.

Outcome 3: Marine and maritime application
Students apply knowledge and skills to interact with and investigate elements of the marine and maritime environment.
In achieving this outcome, students investigate:

- management of marine resources
- aspects of maritime archaeology
- interrelationships within the marine environment.

Course content

The course content is the focus of the learning program.

The course content is divided into three content areas:

- Marine
- Maritime
- Concepts and skills.

It is the responsibility of the school to ensure that the required level of duty of care is exercised in relation to the health and safety of all students undertaking water–based outdoor activities as part of this course. The implementation of effective safety management plans and processes should ensure that all activities are conducted safely. This includes ensuring all rules and regulations and ratios for water–based outdoor activities are rigorously followed. Teachers should refer to relevant school system/sector guidelines and/or current best practices for each specific water–based outdoor activity engaged in for guidance.

Marine

Oceanography
The biological, chemical, geological and physical realms of oceanography are studied from an introductory level through to detailed examination of various aspects. The biological realm includes the study of marine plant and animal life, the acquisition of observation and data collection methods, the investigation of cycling through systems and the study of specific ecosystems and the impact of current environmental conditions. The chemical realm includes properties of sea water and various methods of water testing. The geological realm includes coastal landforms and features, erosion and coastal engineering structures. The physical realm includes ocean tides and currents, the effects of wind, seismic action and waves and global circulation systems.

Environmental and resources management
Australia's marine environment is vast and varied. Responsible management is essential for the sustainability of marine resources and to maintain biodiversity. This section of the course investigates issues facing the marine environment as a result of its use by humans and the range of management strategies employed by local and national authorities. There is a specific focus on the fishing industry and tourism.

Maritime

Design
The basic design process is used as an introduction to this section. Students then use this as a foundation for investigating the design features and characteristics of materials used to construct various marine and maritime equipment and craft/boats.

Small craft
The care and maintenance of typical small craft is the focus of content in this area. Parts of a typical small craft that are investigated include propulsion, fuel, ignition and cooling systems. This also includes the care, diagnosis and maintenance of these systems.

History and archaeology
Western Australia is extremely rich in maritime history, archaeology and cultural heritage. The significance in the exploration of the Western Australian coastline in the 1600s is acknowledged in this section. Wreck sites, methods of locating, conservation and retrieval are examined in detail. There is a special focus on local significant Western Australian wrecks and the Batavia is explored in detail.

Concepts and skills

Nautical concepts and skills
This section provides students with the opportunity to develop practical skills and knowledge related to boating, snorkelling/diving or sailing. Boating includes the study of nautical concepts such as trip planning, rules and regulations, safety equipment, emergency situations, collision avoidance and maintenance, as well as the development of seamanship and charting skills. This may be in either sail or power boats.

Working scientifically
Scientific method is the process of answering questions. Students use the scientific method as a means of investigating various aspects of the marine environment. Elements of scientific investigation include planning and conducting an experiment, processing and evaluating data.

Course units

Each unit is defined with a particular focus and a selection of learning contexts through which the specific unit content can be taught and learnt. The cognitive difficulty of the content increases with each stage. The pitch of the content for each stage is notional and there will be overlap between stages.

Stage 1 units provide bridging support and a practical and applied focus to help students develop skills required to be successful for Stage 2 units.

Stage 2 units provide opportunities for applied learning but there is a focus more on academic learning.

Stage 3 units provide opportunities to extend knowledge and understandings in challenging academic learning contexts.

Unit 1AMMS

This unit introduces students to marine ecosystems, ocean tides and how to conduct various water tests. Western Australian recreational and commercial fishing issues and solutions are examined.

Students gain an understanding of maritime construction materials and aspects of small craft including buoyancy and design of pulley systems.

Concepts associated with either snorkelling or sailing are studied and introductory skills associated with planning and conducting a scientific experiment will be developed.

Unit 1BMMS

This unit looks at the cycling of matter and the flow of energy through marine ecosystems, the types of waves and their impact on coastlines, major ocean currents operating off the Western Australian coastline and the significance of marine protected areas in managing the marine resource.

Design features of a number of examples of marine/maritime equipment and the various component systems within a vessel are examined.

Students will have the opportunity to develop practical skills in either snorkelling or sailing. Science process skills of processing data, evaluating methods and reporting on findings are developed.

Unit 1CMMS

This unit investigates local Western Australian ecosystems, the biotic and abiotic factors that influence them and comparison of their productivity levels, ocean currents and properties associated with seawater. Resource management strategies such as aquaculture, whale shark tourism and wilderness dives with dolphins are explored.

Vessel design and the weathering of construction materials are investigated and the features and function of secondary vessel systems are identified.

Concepts associated with power boating are introduced and skills associated with planning and conducting a scientific experiment are developed.

Unit 1DMMS

This unit includes investigation of ocean surface currents and their role in energy transfer, the cycling of matter through the marine ecosystem, the interdependence of organisms within a food web and the process of coastal erosion. Australia's marine resource issues and the design, management and purpose of ports and anchorages are explored.

Maritime construction materials are compared and aspects of small craft, including maintenance and diagnostic testing, are considered.

Students will have the opportunity to develop a range of seamanship skills in power boating. Science process skills of processing data, evaluating methods and reporting on findings are developed.

Unit 2AMMS

This unit examines types of Western Australian marine ecosystems, ocean currents, marine protected areas and the state of the marine environment.

Common nautical craft design features are investigated. Maritime history and archaeology are introduced in this unit and historic sea routes and exploration and mapping of the Western Australian coastline are studied.

Nautical concepts such as trip planning, rules and regulations, safety equipment, emergency situations, collision avoidance and maintenance associated with small boat handling are examined. Students further develop the skills associated with scientific investigations including planning, researching, conducting and recording.

Unit 2BMMS

This unit examines the cycling of matter through the marine ecosystem, the interdependence of organisms, global ocean currents, global atmospheric circulation and properties of seawater. Students investigate issues and strategies involved in the management of local Western Australian fisheries.

Maritime history and archaeology understanding is developed further through the investigation of laws protecting wreck sites, local shipwrecks and the historical significance of artefacts.

Seamanship skills associated with power boating are developed as well as charting skills. Students further develop the skills associated with scientific investigation including analysing data, representing results and communicating findings.

Unit 3AMMS

This unit examines the importance of plankton and coral communities in the marine environment. Major resource management issues affecting Australia's marine environment, including pollution, water quality and over-fishing, are investigated.

Students investigate design features of specific hulls. Students also investigate methods of locating shipwrecks, formation and decay processes, excavation and conservation of artefacts.

The concepts, including some scientific principles, behind snorkelling and diving are considered. The scientific method is applied to the investigation of real-world problems and science process skills used when planning and carrying out investigations are developed.

Unit 3BMMS

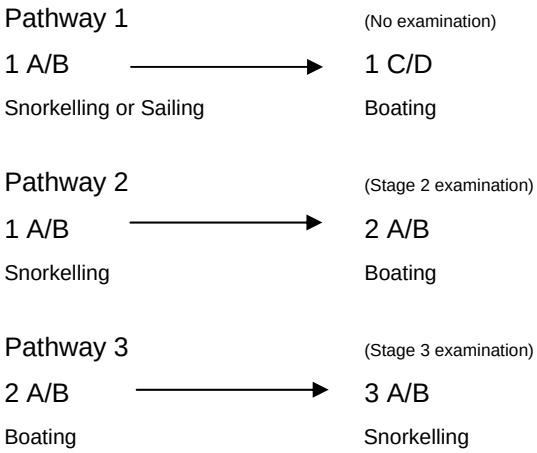
This unit examines the impact of global warming, the process of coastal erosion and coastal engineering structures. Environmental and resource management is considered, including the role of governments in the protection of the marine environment.

Vessel design is considered across a range of uses and students further explore the maritime history of Western Australia through the example of the Batavia shipwreck.

Students have the opportunity to develop skills relating to snorkelling and diving. Students conduct scientific investigations using a range of process skills that ensure the accuracy of results and validity of their conclusions.

Course pathways

The following pathways are recommended for the study of Marine and Maritime Studies. The water skills focus for each pathway is also included.



Pathway 1
Typically for students who enter the course with limited experience and undertake Marine and Maritime Studies at an introductory stage and for those who may wish to continue their interest in the marine and maritime area.

Pathway 2
Typically for students who enter the course with limited experience, knowledge and understanding of Marine and Maritime Studies and may wish to access further educational opportunities. Students who choose this pathway will complete the Stage 2 external examination in their final year of school.

Note: for students following Pathway 2 it is expected that they undertake snorkelling as the nautical concepts and skills focus in Stage 1 as this enables greater access to fieldwork in Stage 2.

Pathway 3
Typically for students who wish to pursue tertiary education pathways. Students who choose this pathway will complete the Stage 3 external examination in their final year of school.

Note: due to the nature of the content in Marine and Maritime Studies it is not intended that students would follow a pathway of Units 1C/D followed by Units 2A/B.

Time and completion requirements

The notional hours for each unit are 55 class contact hours. Units can be delivered typically in a semester or in a designated time period up to a year depending on the needs of the students. Pairs of units can also be delivered concurrently over a one year period. Schools are encouraged to be flexible in their timetabling in order to meet the needs of all of their students.

Refer to the WACE Manual for more information about unit and course completion.

Resources

Teacher support materials are available on the School Curriculum and Standards Authority website extranet and can be found at www.scsa.wa.edu.au

Vocational Education and Training information

Vocational Education and Training (VET) is nationally recognised training that provides people with occupational knowledge and skills and credit towards, or attainment of, a vocational education and training qualification under the Australian Qualifications Framework (AQF).

When considering VET delivery in WACE courses it is necessary to:

- refer to the WACE Manual, Section 5: Vocational Education and Training, and
- contact education sector/systems representatives for information on operational issues concerning VET delivery options in schools.

Australian Quality Training Framework (AQTF)
AQTF is the quality system that underpins the national vocational education and training sector and outlines the regulatory arrangements in states and territories. It provides the basis for a nationally consistent, high-quality VET system.

The AQTF Essential Conditions and Standards for Registered Training Organisations outline a set of auditable standards that must be met and maintained for registration as a training provider in Australia.

VET integrated delivery

VET integrated within a WACE course involves students undertaking one or more VET units of competency concurrently with a WACE course unit. No unit equivalence is given for units of competency attained in this way.

VET integrated can be delivered by schools providing they meet AQTF requirements. Schools need to become a Registered Training Organisation (RTO) or work in a partnership arrangement with an RTO to deliver training within the scope for which they are registered. If a school operates in partnership with an RTO, it will be the responsibility of the RTO to assure the quality of the training delivery and assessment.

The content in this course may align with content in specific VET units of competency from a nationally recognised training package. Achievement of units of competency achieved in this manner may lead to the completion of a full or partial AQF qualification.

Schools seeking to link delivery of this course with units of competency must read the training package rules for the relevant units of competency and associated qualifications on the Training.gov.au website: www.training.gov.au. This should be done in consultation with the RTO they are in partnership with for certification of the competencies in order to establish suitability of units intended for integration with this course.

Assessment

The WACE Manual contains essential information on principles, policies and procedures for school-based assessment and WACE examinations that needs to be read in conjunction with this document.

School-based assessment

The table below provides details of the assessment types for this course and the weighting range for each assessment type.

Teachers are required to use the assessment table to develop their own assessment outline for each unit (or pair of units) of the course.

This outline includes a range of assessment tasks and indicates the weighting for each task and each assessment type. It also indicates the content and course outcomes each task covers.

If a pair of units is assessed using a combined assessment outline, the assessment requirements must still be met for each unit.

In developing an assessment outline and teaching program the following guidelines should be taken into account.

- All assessment tasks should take into account the teaching, learning and assessment principles outlined in the WACE Manual.
- There is flexibility for teachers to design school-based assessment tasks to meet the learning needs of students.
- The assessment table outlines the forms of student response required for this course.
- Student work submitted to demonstrate achievement should only be accepted if the teacher can attest that, to the best of her/his knowledge, all uncited work is the student's own.
- Evidence collected for each unit must include assessment tasks conducted under test conditions together with other forms of assessment tasks.

Assessment table

Weightings for types			Type of assessment
Stage 1	**Stage 2**	**Stage 3**	
20–30%	10–20%	10–20%	**Investigation and scientific skills** Research in which students plan and conduct an investigation; process and analyse data, evaluate their plan, procedures and findings and communicate their conclusions Types of investigations may include: experiments into an aspect of the marine environment, the human impact on a natural marine environment or factors affecting the seaworthiness of a vessel or scientific research into specific marine and maritime issues. Tasks and/or exercises designed to develop and/or assess a range of scientific skills and conceptual understanding of scientific principles and skills associated with processing data. Types of scientific skills may include: classification exercises, design and construction of scientific testing/collecting equipment or models and microscope work. Evidence may be collected in the form of scientific reports, videos, photographic or audio recordings (podcast).
50–60%	20–30%	10–20%	**Practical** Practical tasks assess how students perform in a practical activity where they demonstrate specific skills or strategies. Types of practical tasks may include: snorkelling, boating, knot tying, navigation and charting, radio operation, delivering a safety briefing, performance of maintenance tests. Evidence of their ability may be collected over a period of time. Teachers can collect evidence through direct observation or through the use of video. A marking key with observation points to assist in making judgements of the student's performance of the sub-skills of each skill is used.
0–10%	10–20%	10–20%	**Assignments and classwork** Students apply their understanding and skills to analyse and evaluate information, prepare reports, present responses to extended and/or open-ended questions and solve problems through a combination of work that may be done inside and outside class time. Types of evidence may include: exercises requiring analysis and evaluation of scientific information in articles from scientific journals, popular media and/or advertising; responses to specific questions based on individual research; portfolio of work addressing a specific topic; and PowerPoint/video/audio presentations on a selected topic.
20–30%	40–50%	50–60%	**Tests and examinations** Students apply their understanding and skills, to analyse, interpret, solve problems and answer questions in supervised classroom settings. Tasks are more structured and are conducted in supervised classroom settings. These require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills and knowledge of factual information. It is expected that assessment items would include open-ended questions to allow students to respond at their highest level of understanding. Types of evidence may include: diagnostic, formative and summative tests and examinations, comprehension and interpretation exercises, exercises requiring analysis and evaluation of both qualitative and quantitative scientific information and responses to discussions and/or presentations.

Grades

Schools report student achievement in a completed unit at Stage 1, 2 or 3 in terms of grades. The following grades are used:

Grade	Interpretation
A	Excellent achievement
B	High achievement
C	Satisfactory achievement
D	Limited achievement
E	Inadequate achievement

Each grade is based on the student's overall performance for the unit as judged by reference to a set of pre-determined standards. These standards are defined by grade descriptions and annotated work samples.

The grade descriptions for this course are provided in Appendix 1. They can also be accessed, together with annotated work samples, through the Guide to Grades link on the course page of the Authority website at www.scsa.wa.edu.au

Refer to the WACE Manual for further information regarding grades.

WACE Examinations

In their final year, students who are studying at least one Stage 2 pair of units (e.g. 2A/2B) or one Stage 3 pair of units (e.g. 3A/3B) are required to sit an examination in this course, unless they are exempt.

WACE examinations are not held for Stage 1 units and/or Preliminary Stage units. Any student may enrol to sit a Stage 2 or Stage 3 examination as a private candidate.

Each examination assesses the specific content described in the syllabus for the pair of units studied.

Details of the WACE examinations in this course are prescribed in the WACE examination design briefs (pages 27–29).

Refer to the WACE Manual for further information regarding WACE examinations.

Standards Guides

Standards for this course are exemplified in Standards Guides. They include examination questions, annotated candidate responses at the 'excellent' and 'satisfactory' achievement bands, statistics for each question and comments from examiners. The guides are published on the Authority's web site at www.scsa.wa.edu.au and are accessed under Examination materials. An extranet log-in is required to view the guides.

UNIT 1AMMS

Unit description

The unit description provides the focus for teaching the specific unit content.

This unit introduces students to marine ecosystems, ocean tides and how to conduct various water tests. Western Australian recreational and commercial fishing issues and solutions are examined.

Students gain an understanding of maritime construction materials and aspects of small craft including buoyancy and design of pulley systems.

Concepts associated with either snorkelling or sailing are studied and introductory skills associated with planning and conducting a scientific experiment will be developed.

Unit content

This unit includes knowledge, understandings and skills to the degree of complexity described below:

Marine

Oceanography

- definition of oceanography: biological, chemical, geological, physical
- marine ecosystems: basic types, common abiotic and biotic components
- identification, classification and description of examples of marine life such as protists, algae, angiosperms, protozoans, porifera, cniderias, platyhelminthes, nematodes, annelids, molluscs, echinoderms, arthropods, chordates
- ocean tides: cause and effects, cycles, charts
- wind formation including land and sea breezes
- methods of water testing such as pH, salinity, temperature, turbidity.

Environmental and resource management

- issues related to Western Australian fisheries such as management, control of fishing efforts, sustainable yields
- rules and regulations relating to Western Australian recreational fishing and commercial fisheries.

Maritime

Design

- basic design process: investigate, devise, evaluate
- marine construction materials: properties, purpose and uses of
  - natural materials such as wood, animal skins, plant fibres
  - synthetic materials: such as steel, aluminium and fibreglass
- effects of sunlight, water, salt, oxygen and living organisms on construction materials.

Small craft

- nautical terminology: basic parts of a boat
- factors affecting buoyancy and stability such as
  - free surface effect
  - passengers and equipment
  - freeboard
  - listing
  - moving loads
  - stowage systems
- design, construction and use of pulley systems.

Concepts and skills

Nautical concepts and skills

NB Select either Snorkelling and diving or Sailing. See Pathway 2 advice, page 6.

Snorkelling and diving

- snorkelling equipment: types, preparation, fitting and removing, care, maintenance
- pre- and post-dive care of equipment
- buddy responsibilities: pre-dive safety check, monitoring
- underwater vision: the eyes, refraction, light and colour
- underwater hearing: the ear, effects of water on sound
- methods to manage heat loss underwater
- positive, negative and neutral buoyancy
- pressure: effect of depth on body
- barotraumas
- Archimedes principle.

Sailing

- the history of sail and its significance
- types of sailing craft (square, rigged, gaff rigged, Bermudian)
- parts of a sailing dinghy
- sail design
  - developed for different races
  - different sail shapes and sailing rigs
- sail shapes and sailing rigs
- simple machines in sailing boats
- the forces acting on a sail boat
- Bernoulli's principle and sails
- forces acting on a boat or board through its sail
- points of sail.

Working scientifically

Planning an experiment

- construct a simple hypothesis, identify basic variables, describe experimental method.

Conducting an experiment

- work safely and responsibly in the field and the laboratory
- observe and classify
- collect data
- consider sources of error.

VET integrated units of competency

Units of competency may be integrated in appropriate learning contexts if all AQTF requirements are met. No unit equivalence is awarded for units of competency achieved in this way. Please refer to the VET section at the front of this syllabus for further information.

Assessment

The three types of assessment in the table below are consistent with the teaching and learning strategies considered to be the most supportive of student achievement of the outcomes in the Marine and Maritime Studies course. The table provides details of the assessment type, examples of different ways that these assessment types can be applied and the weighting range for each assessment type.

Weighting Stage 1	Type of assessment
20–30%	**Investigation and scientific skills** Research in which students plan and conduct an investigation; process and analyse data, evaluate their plan, procedures and findings and communicate their conclusions Types of investigations may include: experiments into an aspect of the marine environment, the human impact on a natural marine environment or factors affecting the seaworthiness of a vessel or scientific research into specific marine and maritime issues. Tasks and/or exercises designed to develop and/or assess a range of scientific skills and conceptual understanding of scientific principles and skills associated with processing data. Types of scientific skills may include: classification exercises, design and construction of scientific testing/collecting equipment or models and microscope work. Evidence may be collected in the form of scientific reports, videos, photographic or audio recordings (podcast).
50–60%	**Practical** Practical tasks assess how students perform in a practical activity where they demonstrate specific skills or strategies. Types of practical tasks may include: snorkelling, sailing, completing a pre-dive safety check, performance of care and maintenance on equipment. Evidence of their ability may be collected over a period of time. Teachers can collect evidence through direct observation or through the use of video. A marking key with observation points to assist in making judgements of the student's performance of the sub-skills of each skill is used.
0–10%	**Assignments and classwork** Students apply their understanding and skills to analyse and evaluate information, prepare reports, present responses to extended and/or open-ended questions and solve problems through a combination of work that may be done inside and outside class time. Types of evidence may include: exercises requiring analysis and evaluation of scientific information in articles from scientific journals, popular media and/or advertising; responses to specific questions based on individual research; portfolio of work addressing a specific topic; and PowerPoint/video/audio presentations on a selected topic.
20–30%	**Tests** Students apply their understanding and skills to analyse, interpret, solve problems and answer questions supervised classroom settings. Tasks are more structured and are conducted in supervised classroom settings. These require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills and knowledge of factual information. Types of evidence may include: diagnostic, formative and summative tests, comprehension and interpretation exercises, exercises requiring analysis and evaluation of both qualitative and quantitative scientific information and responses to discussions and/or presentations.

UNIT 1BMMS

Unit description

The unit description provides the focus for teaching the specific unit content.

This unit looks at the cycling of matter and the flow of energy through marine ecosystems, the types of waves and their impact on coastlines, major ocean currents operating off the Western Australian coastline and the significance of marine protected areas in managing the marine resource.

Design features of a number of examples of marine/maritime equipment and the various component systems within a vessel are examined.

Students will have the opportunity to develop practical skills in either snorkelling or sailing. Science process skills of processing data, evaluating methods and reporting on findings are developed.

Unit content

This unit includes knowledge, understandings and skills to the degree of complexity described below:

Marine

Oceanography

- food chains and webs within a marine ecosystem
- flow of energy through a marine ecosystem
- methods to measure abiotic factors such as depth (sounding line), visibility (Secchi disk), surface current speed and direction, tidal flow, sound, water temperature
- waves: types, formation, shape, characteristics, effects on coastline, seismic sea waves such as tsunami
- Western Australian ocean currents
  - Leeuwin current
  - West Australian current
  - South Equatorial current
- coastal landforms: names, formation, types, significance.

Environmental and resource management

- Marine Protected Areas, Marine Parks, Reserves and Sanctuary zones: importance and examples
- roles and responsibilities of Western Australian marine resource management organisations: DEC, Fisheries WA, Recfishwest, CSIRO.

Maritime

Design

- design features of marine or maritime equipment such as
  - boat hulls
  - anchors
  - paddles/oars
  - marker buoys
  - scientific testing/collecting equipment
  - fishing lures
  - moorings
- methods of maritime construction: model design and construction to compare various designs.

Small craft

- features of small craft propulsion systems including
  - wind
  - outboard motor
  - inboard motor or jet
- steering and gear systems.

Concepts and skills

Nautical concepts and skills

NB Select either Snorkelling and diving or Sailing. See Pathway 2 advice, page 6.

Snorkelling and diving

- fitting snorkelling gear and weight belts
- buddy, pre-dive safety check
- entry and exit techniques relevant to the environment
- finning: technique, direction control
- snorkel breathing
- underwater swimming
- hand signals
- duck diving, safe descending
- descending and ascending technique
- snorkel clearing: blast and displacement method
- clearing a partially flooded mask
- methods of equalising ear pressure
- tired buddy tow
- cramp release.

Sailing

- knots – clove hitch, round turn and two half-hitches, bowline, figure of eight, sheet bend, reef knot, stopper
- coiling, stowing and heaving of line
- boat preparation – rigging and de-rigging
- launch a sail boat
- centre board position
- capsize and recovery
- leave and return to beach/launching facility
- heave to position
- primary boat control
- balance and trim
- set sails associated with specific points of sail
- sailing on a beam reach

- tacking and jibing
- control boat speed
- sailing a basic Olympic triangle
- disabled sail craft
- diagnose and repair common equipment problems and breakages
- skippers responsibilities
- IALA Buoyage: lateral, cardinal, special, isolated danger, safe water, wreck, marine safety signs, leads (sector light).

Working scientifically

Processing data

- calculate averages from repeated trials or replicates
- identify trends and make comparisons
- display results and draw conclusions.

Evaluating

- make suggestions for improvement
- write scientific reports.

VET integrated units of competency

Units of competency may be integrated in appropriate learning contexts if all AQTF requirements are met. No unit equivalence is awarded for units of competency achieved in this way. Please refer to the VET section at the front of this syllabus for further information.

Assessment

The three types of assessment in the table below are consistent with the teaching and learning strategies considered to be the most supportive of student achievement of the outcomes in the Marine and Maritime Studies course. The table provides details of the assessment type, examples of different ways that these assessment types can be applied and the weighting range for each assessment type.

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50–60%	**Practical** Practical tasks assess how students perform in a practical activity where they demonstrate specific skills or strategies. Types of practical tasks may include: snorkelling, sailing, knot tying, completing a pre-dive safety check. Evidence of their ability may be collected over a period of time. Teachers can collect evidence through direct observation or through the use of video. A marking key with observation points to assist in making judgements of the student's performance of the sub-skills of each skill is used.
0–10%	**Assignments and classwork** Students apply their understanding and skills to analyse and evaluate information, prepare reports, present responses to extended and/or open-ended questions and solve problems through a combination of work that may be done inside and outside class time. Types of evidence may include: exercises requiring analysis and evaluation of scientific information in articles from scientific journals, popular media and/or advertising; responses to specific questions based on individual research; portfolio of work addressing a specific topic; and PowerPoint/video/audio presentations on a selected topic.
20–30%	**Tests** Students apply their understanding and skills to analyse, interpret, solve problems and answer questions in supervised classroom settings Tasks are more structured and are conducted in supervised classroom settings. These require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills and knowledge of factual information. Types of evidence may include: diagnostic, formative and summative tests, comprehension and interpretation exercises, exercises requiring analysis and evaluation of both qualitative and quantitative scientific information and responses to discussions and/or presentations.

UNIT 1CMMS

Unit description

The unit description provides the focus for teaching the specific unit content.

This unit investigates local Western Australian ecosystems, the biotic and abiotic factors that influence them and comparison of their productivity levels, ocean currents and properties associated with seawater. Resource management strategies such as aquaculture, whale shark tourism and wilderness dives with dolphins are explored.

Vessel design and the weathering of construction materials are investigated and the features and function of secondary vessel systems are identified.

Concepts associated with power boating are introduced and skills associated with planning and conducting a scientific experiment are developed.

Unit content

This unit includes knowledge, understandings and skills to the degree of complexity described below:

Marine

Oceanography

- Western Australian marine ecosystems: location, characteristics (such as estuaries and mangroves)
- construction and use of simple apparatus that can be used to measure abiotic factors of a marine ecosystem
- methods of measuring biotic factors such as transects and quadrats
- comparison of the productivity of a variety of Western Australian marine ecosystems
- factors that create ocean currents such as wind, Earth's rotation (Coriolis force), water temperature differences and water density
- properties of sea water such as salinity, solvent properties, density, affect on light and sound, viscosity.

Environmental and resource management

- how aquaculture is used as a solution to decline in fish stocks
- managing human interactions in marine environments such as whale shark ecotourism, interactions with dolphins in the wild and whale watching.

Maritime

Design

- common forms of construction material protection used in marine craft such as
  - antifouling
  - sacrificial anodes
- vessel design variation according to specific use such as
  - commercial fishing boats
  - yachts
  - dive boats.

Small craft

- the outboard motor: basic parts, function, operating temperature, compression, horsepower
- features of 2 stroke and 4 stroke motors
- features of small craft systems including
  - bilges: bilge pump
  - electrical: batteries, fuses, spark plugs
  - fuel: fuel lines
  - mooring lines: fenders, care of
  - anchoring equipment: scope, shackles
- equipment care and maintenance including
  - record of slippings and refits
  - rollers and fume detectors.

Concepts and skills

Nautical concepts and skills

Power boating

Trip planning

- boat preparation: safety equipment check, ramp etiquette, launch and recovery of a vessel
- components of weather: temperature, rainfall, wind, clouds, seas and swell
- marine weather forecasts: bureau of meteorology and other models
- weather map/forecast interpretation relating to
  - local weather effects
  - wind against tide or current
  - wind strength/frontal squalls
- log on, log off.

Rules and regulations

- skippers responsibilities and duty of care: new crew induction, sinking, breakdown, fire, grounding, health related problems, person overboard, search for and rescue a person overboard, collision, capsize, abandon ship, grab bags, survival in water, passengers/crews duties, code of conduct, reporting of accidents and rules
- registration of vessels
- port authority, licensing, commercial regulations, recognition of operational areas.

Safety equipment

- mandatory safety equipment: bilge pump, fire extinguisher, anchor, life jacket, flares, Emergency Positioning Indicator Radio Beacon (EPIRB), parachute flares, marine radio

- safety equipment expiry dates, care and maintenance, stowage, accessibility
- non-mandatory safety equipment: chart, first aid kit, minor tool kit, knife, mask and snorkel, torch, clothing, extra lines (ropes), sunscreen, water, extra fuel
- distress signals: radio (mayday, pan-pan), Emergency Positioning Indicator Radio Beacon (EPIRB), flares, phone.

Emergency situations
- safety briefing: first aid, seasickness, sunburn, safety equipment, code of behaviour, alcohol. movement about vessel, emergency signalling, fitting a PFD
- fire causes: engine, LPG, bilge and engine room cleanliness, refuelling.

Collision avoidance
- IALA Buoyage: lateral, cardinal, special, isolated danger, safe water, wreck, marine safety signs, leads (sector light)
- International regulations for preventing collisions at Sea 1972 (as amended).

Maintenance
- routine checks: electrical, fuel, cooling system, oil, propellers.

Working scientifically

Planning an experiment
- construct hypothesis, identify variables, describe experimental method.

Conducting an experiment
- work safely and responsibly in the field and the laboratory
- observe and classify
- collect data
- consider sources of error.

VET integrated units of competency

Units of competency may be integrated in appropriate learning contexts if all AQTF requirements are met. No unit equivalence is awarded for units of competency achieved in this way. Please refer to the VET section at the front of this syllabus for further information.

Assessment

The three types of assessment in the table below are consistent with the teaching and learning strategies considered to be the most supportive of student achievement of the outcomes in the Marine and Maritime Studies course. The table provides details of the assessment type, examples of different ways that these assessment types can be applied and the weighting range for each assessment type.

Weighting Stage 1	Type of assessment
20–30%	**Investigation and scientific skills** Research in which students plan and conduct an investigation; process and analyse data, evaluate their plan, procedures and findings and communicate their conclusions Types of investigations may include: experiments into an aspect of the marine environment, the human impact on a natural marine environment or factors affecting the seaworthiness of a vessel or scientific research into specific marine and maritime issues. Tasks and/or exercises designed to develop and/or assess a range of scientific skills and conceptual understanding of scientific principles and skills associated with processing data. Types of scientific skills may include: classification exercises, design and construction of scientific testing/collecting equipment or models and microscope work. Evidence may be collected in the form of scientific reports, videos, photographic or audio recordings (podcast).
50–60%	**Practical** Practical tasks assess how students perform in a practical activity where they demonstrate specific skills or strategies. Types of practical tasks may include: boating, radio operation, delivering a safety briefing, performance of maintenance tests. Evidence of their ability may be collected over a period of time. Teachers can collect evidence through direct observation or through the use of video. A marking key with observation points to assist in making judgements of the student's performance of the sub-skills of each skill is used.
0–10%	**Assignments and classwork** Students apply their understanding and skills to analyse and evaluate information, prepare reports, present responses to extended and/or open-ended questions and solve problems through a combination of work that may be done inside and outside class time. Types of evidence may include: exercises requiring analysis and evaluation of scientific information in articles from scientific journals, popular media and/or advertising; responses to specific questions based on individual research; portfolio of work addressing a specific topic; and PowerPoint/video/audio presentations on a selected topic.
20–30%	**Tests** Students apply their understanding and skills to analyse, interpret, solve problems and answer questions in supervised classroom settings. Tasks are more structured and are conducted in supervised classroom settings. These require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills and knowledge of factual information. Types of evidence may include: diagnostic, formative and summative tests, comprehension and interpretation exercises, exercises requiring analysis and evaluation of both qualitative and quantitative scientific information and responses to discussions and/or presentations.

UNIT 1DMMS

Unit description

The unit description provides the focus for teaching the specific unit content.

This unit includes investigation of ocean surface currents and their role in energy transfer, the cycling of matter through the marine ecosystem, the interdependence of organisms within a food web and the process of coastal erosion. Australia's marine resource issues and the design, management and purpose of ports and anchorages are explored.

Maritime construction materials are compared and aspects of small craft, including maintenance and diagnostic testing, are considered.

Students will have the opportunity to develop a range of seamanship skills in power boating. Science process skills of processing data, evaluating methods and reporting on findings are developed.

Unit content

This unit includes knowledge, understandings and skills to the degree of complexity described below:

Marine

Oceanography

- global surface ocean currents: names, locations, role in energy transfer
- cycling of carbon and water through a marine ecosystem
- food webs within a marine ecosystem
- coastal erosion: long shore currents and deposition.

Environmental and resource management

- Australia's marine resources and issues affecting them: renewable and non-renewable, tourism and recreation use, shipping and ports, offshore petroleum exploration
- ports and anchorages (local examples only): purpose and basic design features
- management of ports, anchorages, marinas and harbours including Fremantle Port Authority.

Maritime

Design

- characteristics of maritime construction materials such as wood, steel, aluminium, concrete, fibreglass and plastic.

Small craft

- maintenance log: use, purpose
- effect of poor marine craft maintenance on the marine environment
- fuel and ignition: petrol/oil mix, petrol and diesel
- cooling system: basic operation, checks, telltale
- engine diagnostics
  - equipment
  - procedures
  - treatment of problems/faults
- management of engine failure in small craft: protocols/procedures.

Concepts and skills

Nautical concepts and skills

Power boating

- operate a vessel safely
- use berthing and mooring equipment
- tie knots: reef, bowline, sheet bend, clove hitch, round turn and two half hitches
- ropes: coiling, throwing a line, using bits and cleats
- conducting a safety briefing
- preparation and starting of motors
- skippers logging on and logging off
- departing the berth
- performing a man overboard
- driving a transit
- performing a controlled stop
- returning to the berth (securing a vessel).

Working scientifically

Processing data

- calculate averages from repeated trials or replicates
- identify trends and make comparisons
- display results.

Evaluating

- make suggestions for improvement
- write scientific reports.

VET integrated units of competency

Units of competency may be integrated in appropriate learning contexts if all AQTF requirements are met. No unit equivalence is awarded for units of competency achieved in this way. Please refer to the VET section at the front of this syllabus for further information.

Assessment

The three types of assessment in the table below are consistent with the teaching and learning strategies considered to be the most supportive of student achievement of the outcomes in the Marine and Maritime Studies course. The table provides details of the assessment type, examples of different ways that these assessment types can be applied and the weighting range for each assessment type.

Weighting Stage 1	Type of assessment
20–30%	**Investigation and scientific skills** Research in which students plan and conduct an investigation; process and analyse data, evaluate their plan, procedures and findings and communicate their conclusions Types of investigations may include: experiments into an aspect of the marine environment, the human impact on a natural marine environment or factors affecting the seaworthiness of a vessel or scientific research into specific marine and maritime issues. Tasks and/or exercises designed to develop and/or assess a range of scientific skills and conceptual understanding of scientific principles and skills associated with processing data. Types of scientific skills may include: classification exercises, design and construction of scientific testing/collecting equipment or models and microscope work. Evidence may be collected in the form of scientific reports, videos, photographic or audio recordings (podcast).
50–60%	**Practical** Practical tasks assess how students perform in a practical activity where they demonstrate specific skills or strategies. Types of practical tasks may include: boating, knot tying radio operation, delivering a safety briefing. Evidence of their ability may be collected over a period of time. Teachers can collect evidence through direct observation or through the use of video. A marking key with observation points to assist in making judgements of the student's performance of the sub-skills of each skill is used.
0–10%	**Assignments and classwork** Students apply their understanding and skills to analyse and evaluate information, prepare reports, present responses to extended and/or open-ended questions and solve problems through a combination of work that may be done inside and outside class time. Types of evidence may include: exercises requiring analysis and evaluation of scientific information in articles from scientific journals, popular media and/or advertising; responses to specific questions based on individual research; portfolio of work addressing a specific topic; and PowerPoint/video/audio presentations on a selected topic.
20–30%	**Tests** Students apply their understanding and skills to analyse, interpret, solve problems and answer questions in supervised classroom settings. Tasks are more structured and are conducted in supervised classroom settings. These require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills and knowledge of factual information. Types of evidence may include: diagnostic, formative and summative tests, comprehension and interpretation exercises, exercises requiring analysis and evaluation of both qualitative and quantitative scientific information and responses to discussions and/or presentations.

UNIT 2AMMS

Unit description

The unit description provides the focus for teaching the specific unit content.

This unit examines types of Western Australian marine ecosystems, ocean currents, marine protected areas and the state of the marine environment.

Common nautical craft design features are investigated. Maritime history and archaeology are introduced in this unit and historic sea routes and exploration and mapping of the Western Australian coastline are studied.

Nautical concepts such as trip planning, rules and regulations, safety equipment, emergency situations, collision avoidance and maintenance associated with small boat handling are examined. Students further develop the skills associated with scientific investigations including planning, researching, conducting and recording.

Unit content

This unit includes knowledge, understandings and skills to the degree of complexity described below. This is the examinable content of the course.

Marine

Oceanography

- location and characteristics of Western Australian marine ecosystems including
  - sea grass meadows
  - reefs
  - deep seas
  - estuaries
  - mangroves
- construction and use of simple apparatus to measure abiotic factors of a marine ecosystem
- methods of measuring biotic factors: transects, quadrats
- comparison of the biological productivity of various Western Australian marine ecosystems
- factors that create ocean currents including
  - wind
  - Earth's rotation—Coriolis force
  - water temperature differences
  - water density differences.

Environmental and resource management

- strategies for the protection of Western Australian marine environments including
  - marine protected areas
  - marine parks
  - reserves
  - sanctuary zones
- Australian Exclusive Economic Zone (AEEZ): description and location
- 'The State of Australia's Marine Environment Report' (SOMER): major findings, issues identified and recommendations for future directions.

Maritime

Design

- common craft design features including
  - efficiency
  - comfort
  - safety
  - cost effectiveness.

History and archaeology

- impact of world trade patterns and historic sea routes, including Brouwer's route, on Western Australian coastal exploration
- importance of exploration and mapping of the Western Australian coastline including that carried out by de Vlamingh and Hartog.

Concepts and skills

Nautical concepts and skills

Power boating

Trip planning

- boat preparation: safety equipment check, ramp etiquette, launch and recovery of a vessel
- components of weather: temperature, rainfall, wind, clouds, seas and swell, storms and cyclones
- marine weather forecasts, including bureau of meteorology and other models
- weather map and forecast interpretation: local weather effects, wind against tide or current, wind strength/frontal squalls
- log on, log off
- charts: symbols, scale chart work in local waters: distance, speed and time, magnetic variation and compass bearing conversions.

Rules and regulations

- skippers responsibilities and duty of care: new crew induction, sinking, breakdown, fire, grounding, health related problems, person overboard, search for and rescue a person overboard, collision, capsize, abandon ship, grab bags, survival in water, passengers/crews duties, code of conduct, reporting of accidents and rules
- registration of vessels
- port authority, licensing, commercial regulations, recognition of operational areas.

Safety equipment

- mandatory safety equipment: bilge pump, fire extinguisher, anchor, life jacket, flares, Emergency Positioning Indicator Radio Beacon (EPIRB), parachute flares, marine radio (VHF, 27 MHz)

- safety equipment expiry dates, care and maintenance, stowage, accessibility
- non-mandatory safety equipment: chart, first aid kit, minor tool kit, knife, mask and snorkel, torch, clothing, extra lines (ropes), sunscreen, water, extra fuel
- distress signals: radio (mayday, pan-pan, securite), Emergency Positioning Indicator Radio Beacon (EPIRB), flares, phone.

Emergency situations
- safety briefing: first aid, seasickness, sunburn, safety equipment, code of behaviour, alcohol, movement about vessel, emergency signalling, fitting a PFD
- fire causes: engine, LPG, bilge and engine room cleanliness, refuelling.

Collision avoidance
- IALA Buoyage: lateral, cardinal, special, isolated danger, safe water, wreck, marine safety signs, leads (sector light)
- International regulations for preventing collisions at Sea 1972 (as amended).

Maintenance
- routine checks: electrical, fuel, cooling system, oil, propellers.

Working scientifically

Planning an experiment
- scientific method: conduct background research, construct hypothesis, identify variables, plan experimental methods.

Conducting an experiment
- work safely and responsibly in the field and the laboratory
- collect reliable data in the field and the laboratory
- make accurate observations and classify based on observable characteristics
- minimise sources of error (large sample size, replicates, repeat trials, random sampling).

VET integrated units of competency

Units of competency may be integrated in appropriate learning contexts if all AQTF requirements are met. No unit equivalence is awarded for units of competency achieved in this way. Please refer to the VET section at the front of this syllabus for further information.

Assessment

The three types of assessment in the table below are consistent with the teaching and learning strategies considered to be the most supportive of student achievement of the outcomes in the Marine and Maritime Studies course. The table provides details of the assessment type, examples of different ways that these assessment types can be applied and the weighting range for each assessment type.

Weighting Stage 2	Type of assessment
10–20%	**Investigation and scientific skills** Research in which students plan and conduct an investigation; process and analyse data, evaluate their plan, procedures and findings and communicate their conclusions Types of investigations may include: experiments into an aspect of the marine environment, the human impact on a natural marine environment or factors affecting the seaworthiness of a vessel or scientific research into specific marine and maritime issues. Tasks and/or exercises designed to develop and/or assess a range of scientific skills and conceptual understanding of scientific principles and skills associated with processing data. Types of scientific skills may include: classification exercises, design and construction of scientific testing/collecting equipment or models and microscope work. Evidence may be collected in the form of scientific reports, videos, photographic or audio recordings (podcast).
20–30%	**Practical** Practical tasks assess how students perform in a practical activity where they demonstrate specific skills or strategies. Types of practical tasks may include: boating, navigation and charting, radio operation, delivering a safety briefing, performance of maintenance tests. Evidence of their ability may be collected over a period of time. Teachers can collect evidence through direct observation or through the use of video. A marking key with observation points to assist in making judgements of the student's performance of the sub-skills of each skill is used.
10–20%	**Assignments and classwork** Students apply their understanding and skills to analyse and evaluate information, prepare reports, present responses to extended and/or open-ended questions and solve problems through a combination of work that may be done inside and outside class time. Types of evidence may include: exercises requiring analysis and evaluation of scientific information in articles from scientific journals, popular media and/or advertising; responses to specific questions based on individual research; portfolio of work addressing a specific topic; and PowerPoint/video/audio presentations on a selected topic.
40–50%	**Tests and examinations** Students apply their understanding and skills to analyse, interpret, solve problems and answer questions in supervised classroom settings. Tasks are more structured and are conducted in supervised classroom settings. These require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills and knowledge of factual information. It is expected that assessment items would include open-ended questions to allow students to respond at their highest level of understanding. Types of evidence may include: diagnostic, formative and summative tests and examinations, comprehension and interpretation exercises, exercises requiring analysis and evaluation of both qualitative and quantitative scientific information and responses to discussions and/or presentations.

UNIT 2BMMS

Unit description

The unit description provides the focus for teaching the specific unit content.

This unit examines the cycling of matter through the marine ecosystem, the interdependence of organisms, global ocean currents, global atmospheric circulation and properties of seawater. Students investigate issues and strategies involved in the management of local Western Australian fisheries.

Maritime history and archaeology understanding is developed further through the investigation of laws protecting wreck sites, local shipwrecks and the historical significance of artefacts.

Seamanship skills associated with power boating are developed as well as charting skills. Students further develop the skills associated with scientific investigation including analysing data, representing results and communicating findings.

Unit content

This unit includes knowledge, understandings and skills to the degree of complexity described below. This is the examinable content of the course.

Marine

Oceanography

- cycling of nitrogen, carbon and water through a marine ecosystem
- interdependence of organisms within a marine ecosystem, including food webs
- global surface ocean currents: names, locations role in energy transfer
- global atmospheric circulation systems including
  - Southern Oscillation Index and Walker Circulation
  - El Nino and La Nina
- properties and characteristics of sea water: salinity, solvent properties, heat capacity, density, viscosity, buoyancy, water pressure, light, displacement (including plimsoll line), affect on light, velocity of sound, dissolved gases.

Environmental and resource management

- current issues affecting Western Australia's fisheries (select local examples only) including
  - management practices
  - fish population dynamics
  - sustainable yields
- aquaculture solutions to declining fish stocks
  - types of aquaculture
  - examples and locations
  - environmental issues associated with aquaculture.

Maritime

Design

- characteristics (cost, environmental, aesthetics, functionality) of maritime construction materials including wood, aluminium, fibreglass and plastic.

History and archaeology

- laws protecting wreck sites
- historical information found within a shipwreck
- background and location of local Western Australian shipwrecks including
  - Zuytdorp
  - Vergulde Draeck
- formation and preservation of types of shipwrecks including wooden and iron
- types of relics/artefacts found in shipwrecks.

Concepts and skills

Nautical concepts and skills

Seamanship skills

- operating a vessel safely
- using berthing and mooring equipment
- tying knots: reef, bowline, sheet bend, clove hitch, round turn and two half hitches, coiling, throwing a line, using bitts and cleats
- conducting a safety briefing
- preparation and starting of motors
- skippers logging on and logging off
- departing the berth
- performing a man overboard
- driving a transit
- performing a controlled stop
- returning to the berth (secures vessel).

Charting skills

- estimating a position
- position fixing: single bearing fix, and triangulations to locate position
- performing distance, speed, time calculations
- plotting latitude and longitude
- reading tide charts, calculating tide heights, calculating tide charts (rule of 12ths)
- calculating depth of water under boat
- plotting a course
- calculating magnetic variation and bearing conversions.

Working scientifically

Processing data

- calculate averages from repeated trials or replicates
- data analysis: identify trends, make comparisons, consider validity of results

- display results using appropriate methods including tables and graphs (line, bar, histogram)
- draw conclusions and communicates using relevant scientific language.

Evaluating
- explain specific suggestions for improvements to an investigation
- identify a problem for investigation and reformulate the problem as a testable hypothesis
- write and present scientific reports.

VET integrated units of competency

Units of competency may be integrated in appropriate learning contexts if all AQTF requirements are met. No unit equivalence is awarded for units of competency achieved in this way. Please refer to the VET section at the front of this syllabus for further information.

Assessment

The three types of assessment in the table below are consistent with the teaching and learning strategies considered to be the most supportive of student achievement of the outcomes in the Marine and Maritime Studies course. The table provides details of the assessment type, examples of different ways that these assessment types can be applied and the weighting range for each assessment type.

Weighting Stage 2	Type of assessment
10–20%	**Investigation and scientific skills** Research in which students plan and conduct an investigation; process and analyse data, evaluate their plan, procedures and findings and communicate their conclusions. Types of investigations may include: experiments into an aspect of the marine environment, the human impact on a natural marine environment or factors affecting the seaworthiness of a vessel or scientific research into specific marine and maritime issues. Tasks and/or exercises designed to develop and/or assess a range of scientific skills and conceptual understanding of scientific principles and skills associated with processing data. Types of scientific skills may include: classification exercises, design and construction of scientific testing/collecting equipment or models and microscope work. Evidence may be collected in the form of scientific reports, videos, photographic or audio recordings (podcast).
20–30%	**Practical** Practical tasks assess how students perform in a practical activity where they demonstrate specific skills or strategies. Types of practical tasks may include: boating, knot tying navigation and charting, radio operation, delivering a safety briefing. Evidence of their ability may be collected over a period of time. Teachers can collect evidence through direct observation or through the use of video. A marking key with observation points to assist in making judgements of the student's performance of the sub-skills of each skill is used.
10–20%	**Assignments and classwork** Students apply their understanding and skills to analyse and evaluate information, prepare reports, present responses to extended and/or open-ended questions and solve problems through a combination of work that may be done inside and outside class time. Types of evidence may include: exercises requiring analysis and evaluation of scientific information in articles from scientific journals, popular media and/or advertising; responses to specific questions based on individual research; portfolio of work addressing a specific topic; and PowerPoint/video/audio presentations on a selected topic.
40–50%	**Tests and examinations** Students apply their understanding and skills to analyse, interpret, solve problems and answer questions in supervised classroom settings. Tasks are more structured and are conducted in supervised classroom settings. These require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills and knowledge of factual information. It is expected that assessment items would include open-ended questions to allow students to respond at their highest level of understanding. Types of evidence may include: diagnostic, formative and summative tests and examinations, comprehension and interpretation exercises, exercises requiring analysis and evaluation of both qualitative and quantitative scientific information and responses to discussions and/or presentations.

UNIT 3AMMS

Unit description

The unit description provides the focus for teaching the specific unit content.

This unit examines the importance of plankton and coral communities in the marine environment. Major resource management issues affecting Australia's marine environment, including pollution, water quality and over-fishing, are investigated

Students investigate design features of specific hulls. Students also investigate methods of locating shipwrecks, formation and decay processes, excavation and conservation of artefacts.

The concepts, including some scientific principles, behind snorkelling and diving are considered. The scientific method is applied to the investigation of real-world problems and science process skills used when planning and carrying out investigations are developed.

Unit content

It is recommended that students studying Stage 3 have completed Stage 2 units.

This unit includes knowledge, understandings and skills to the degree of complexity described below. This is the examinable content of the course.

Marine

Oceanography

- phytoplankton and zooplankton: identification, life cycles, interactions, seasonal patterns, importance to fish stocks, measurement (seaWIFS)
- characteristics of coral communities including
  - role and importance to the marine environment
  - coral bleaching process.

Environmental and resource management

- major issues affecting Australia's marine environment including
  - declining water quality
  - loss of habitat
  - over-fishing
  - introduced species
- types of marine pollutants including
  - human and domestic wastes
  - petroleum oil
  - eutrophication
  - heavy metals
- processes used to manage and control marine pollutant problems.

Maritime

Design

- design features of specific hull designs including
  - hard chine
  - catamaran
  - trimaran
  - hydrofoil
  - SWATH
  - wave piercer.

History and archaeology

- methods of locating shipwrecks
- formation and decay processes associated with wreck sites (including metal corrosion)
- underwater wreck site excavation: techniques, processing and recording, recovery of artefacts, lift bags (purpose, use and calculations)
- conservation techniques (on-site and laboratory) including
  - safe retrieval
  - de-concretion
  - stabilisation.

Concepts and skills

Nautical concepts and skills

Snorkelling and diving

- snorkelling equipment: types, preparation, fitting and removing, care, maintenance
- pre- and post-dive care of equipment
- buddy responsibilities: pre-dive safety check, monitoring
- underwater vision: the eyes, refraction, light and colour
- underwater hearing: the ear, effects of water on sound
- heat loss underwater: ways to reduce
- positive, negative and neutral buoyancy
- pressure: effect of depth on body
- Boyle's Law
- barotraumas
- Archimedes principle.

Working scientifically

Planning an experiment

- scientific method: select relevant background information, construct hypothesis, identify variables, design experimental methods
- identify real-world problems for investigation within the marine or maritime context, such as oceanography, environmental and resource management, design, engineering, archaeology
- design and conduct an investigative study in the environment.

Conducting an experiment

- work safely and responsibly in the field and the laboratory
- collect reliable data in the field and in the laboratory

- minimise sources of error by using appropriate methods (large sample size, replicates, repeat trials, random sampling).

Assessment

The three types of assessment in the table below are consistent with the teaching and learning strategies considered to be the most supportive of student achievement of the outcomes in the Marine and Maritime Studies course. The table provides details of the assessment type, examples of different ways that these assessment types can be applied and the weighting range for each assessment type.

Weighting Stage 3	Type of assessment
10–20%	**Investigation and scientific skills** Research in which students plan and conduct an investigation; process and analyse data, evaluate their plan, procedures and findings and communicate their conclusions. Types of investigations may include: experiments into an aspect of the marine environment, the human impact on a natural marine environment or factors affecting the seaworthiness of a vessel or scientific research into specific marine and maritime issues. Tasks and/or exercises designed to develop and/or assess a range of scientific skills and conceptual understanding of scientific principles and skills associated with processing data. Types of scientific skills may include: classification exercises, design and construction of scientific testing/collecting equipment or models and microscope work. Evidence may be collected in the form of scientific reports, videos, photographic or audio recordings (podcast).
10–20%	**Practical** Practical tasks assess how students perform in a practical activity where they demonstrate specific skills or strategies. Types of practical tasks may include: snorkelling, completing a pre-dive safety check, performance of care and maintenance on equipment. Evidence of their ability may be collected over a period of time. Teachers can collect evidence through direct observation or through the use of video. A marking key with observation points to assist in making judgements of the student's performance of the sub-skills of each skill is used.
10–20%	**Assignments and classwork** Students apply their understanding and skills to analyse and evaluate information, prepare reports, present responses to extended and/or open-ended questions and solve problems through a combination of work that may be done inside and outside class time. Types of evidence may include: exercises requiring analysis and evaluation of scientific information in articles from scientific journals, popular media and/or advertising; responses to specific questions based on individual research; portfolio of work addressing a specific topic; and PowerPoint/video/audio presentations on a selected topic.
50–60%	**Tests and examinations** Students apply their understanding and skills to analyse, interpret, solve problems and answer questions in supervised classroom settings Tasks are more structured and are conducted in supervised classroom settings. These require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills and knowledge of factual information. It is expected that assessment items would include open-ended questions to allow students to respond at their highest level of understanding. Types of evidence may include: diagnostic, formative and summative tests and examinations, comprehension and interpretation exercises, exercises requiring analysis and evaluation of both qualitative and quantitative scientific information and responses to discussions and/or presentations.

UNIT 3BMMS

Unit description

The unit description provides the focus for teaching the specific unit content.

This unit examines the impact of global warming, the process of coastal erosion and coastal engineering structures. Environmental and resource management is considered, including the role of governments in the protection of the marine environment.

Vessel design is considered across a range of uses and students further explore the maritime history of Western Australia through the example of the Batavia shipwreck.

Students have the opportunity to develop skills relating to snorkelling and diving. Students conduct scientific investigations using a range of process skills that ensure the accuracy of results and validity of their conclusions.

Unit content

It is recommended that students studying Stage 3 have completed Stage 2 units.

This unit includes knowledge, understandings and skills to the degree of complexity described below. This is the examinable content of the course.

Marine

Oceanography

- impact of the enhanced greenhouse effect on
  - marine habitats and coastal communities
  - coral bleaching
  - global sea levels
  - thermohaline current
- cause, effect and measurement of coastal erosion, including long shore currents, accreting and eroding beaches, deposition and sand budgets
- features, role and impact of coastal engineering structures including
  - physical barriers
  - sand bypass systems
  - artificial reefs
  - ports
  - canals.

Environmental and resource management

- role and responsibilities of governments in protecting the marine environment at local, state, national and international levels
- strategies for managing marine biodiversity including
  - role of marine protected areas and zones
  - global protection of cetaceans
- role of scientific research in marine environmental management
- managing human interactions, including ethics and rules, in marine environments including whale shark ecotourism, interactions with dolphins in the wild, whale watching.

Maritime

Design

- variation in vessel design according to specific use including
  - commercial fishing boats
  - dive boats
  - yachts
  - rigid inflatable boats.

History and archaeology

- the Batavia shipwreck: historical background; location process; survey; excavation; recovery, conservation and interpretation of artefacts.

Concepts and skills

Nautical concepts and skills

Snorkelling and diving

- fitting snorkelling gear and weight belts
- buddy, pre-dive safety check
- mask defogging
- entry and exit techniques relevant to a natural environment
- finning: technique, direction control in a natural environment
- snorkel breathing
- underwater swimming in a natural environment
- hand signals
- duck diving, safe descending
- descending and ascending technique
- snorkel clearing blast and displacement method
- clearing a partially flooded mask
- methods of equalising ear pressure
- tired buddy tow
- cramp release
- ditch and recovery of an object: weight belt
- establish neutral buoyancy at the surface
- making observations while snorkelling in a natural environment
  - slates
  - photography.

Working scientifically

Processing data

- data analysis: identify trends and patterns, consider the validity of results
- select appropriate ways to display results using tables and graphs (line, bar, histogram)
- draw valid conclusions and communicate using relevant scientific language.

Evaluating

- explain specific suggestions for improvement to an investigation
- identify a problem for investigation and reformulate the problem as a testable hypothesis
- write and present scientific reports
- critically reflect on investigations with a focus on the concepts of reliability, validity and identification of variables.

Assessment

The three types of assessment in the table below are consistent with the teaching and learning strategies considered to be the most supportive of student achievement of the outcomes in the Marine and Maritime Studies course. The table provides details of the assessment type, examples of different ways that these assessment types can be applied and the weighting range for each assessment type.

Weighting Stage 3	Type of assessment
10–20%	**Investigation and scientific skills** Research in which students plan and conduct an investigation; process and analyse data, evaluate their plan, procedures and findings and communicate their conclusions Types of investigations may include: experiments into an aspect of the marine environment, the human impact on a natural marine environment or factors affecting the seaworthiness of a vessel or scientific research into specific marine and maritime issues. Tasks and/or exercises designed to develop and/or assess a range of scientific skills and conceptual understanding of scientific principles and skills associated with processing data. Types of scientific skills may include: classification exercises, design and construction of scientific testing/collecting equipment or models and microscope work. Evidence may be collected in the form of scientific reports, videos, photographic or audio recordings (podcast).
10–20%	**Practical** Practical tasks assess how students perform in a practical activity where they demonstrate specific skills or strategies. Types of practical tasks may include: snorkelling and completing a pre-dive safety check. Evidence of their ability may be collected over a period of time. Teachers can collect evidence through direct observation or through the use of video. A marking key with observation points to assist in making judgements of the student's performance of the sub-skills of each skill is used.
10–20%	**Assignments and classwork** Students apply their understanding and skills to analyse and evaluate information, prepare reports, present responses to extended and/or open-ended questions and solve problems through a combination of work that may be done inside and outside class time. Types of evidence may include: exercises requiring analysis and evaluation of scientific information in articles from scientific journals, popular media and/or advertising; responses to specific questions based on individual research; portfolio of work addressing a specific topic; and PowerPoint/video/audio presentations on a selected topic.
50–60%	**Tests and examinations** Students apply their understanding and skills to analyse, interpret, solve problems and answer questions in supervised classroom settings. Tasks are more structured and are conducted in supervised classroom settings. These require students to demonstrate use of terminology, understanding and application of concepts, quantitative skills and knowledge of factual information. It is expected that assessment items would include open-ended questions to allow students to respond at their highest level of understanding. Types of evidence may include: diagnostic, formative and summative tests and examinations, comprehension and interpretation exercises, exercises requiring analysis and evaluation of both qualitative and quantitative scientific information and responses to discussions and/or presentations.

Examination details
Stage 2 and Stage 3

Marine and Maritime Studies
Examination design brief
Stage 2

Time allowed
Reading time before commencing work: ten minutes
Working time for paper: three hours

Permissible items
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction tape/fluid, eraser, ruler, highlighters
Special items: non-programmable calculators approved for use in the WACE examinations, 360° protractors or Douglas protractors, compasses

Additional information
Appendices containing charts, diagrams and/or stimulus pictures could be used for some sections.

Section	Supporting information
Section One **Multiple-choice** 20% of the total examination 20 multiple-choice questions Suggested working time: 30 minutes	
Section Two **Short answer** 50% of the total examination 8–10 short answer questions Suggested working time: 90 minutes	The candidate could be required to respond to stimuli such as short extracts from articles, tables, graphs, charts, diagrams and pictures. They could give answers to these questions in the form of dot points, short paragraphs, diagrams, tables, graphs or charts. At least one question should test the candidate's knowledge and understanding of the process of science. The questions could be scaffolded or sectionalised.
Section Three **Extended answer** 30% of the total examination Two questions from a choice of four Suggested working time: 60 minutes	Questions in this section could require the candidate to interpret, analyse or evaluate diagrams, nautical charts, graphs, scenarios or case studies, excerpts from articles, numerical data, photographs, and draw on their understanding of specific learning contexts or experiences. The questions could be scaffolded or sectionalised.

Marine and Maritime Studies
Examination design brief
Stage 3

Time allowed
Reading time before commencing work: ten minutes
Working time for paper: three hours

Permissible items
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction tape/fluid, eraser, ruler, highlighters
Special items: non-programmable calculators approved for use in the WACE examinations

Additional information
Appendices containing charts, diagrams and/or stimulus pictures could be used for some sections.

Section	Supporting information
Section One **Multiple-choice** 20% of the total examination 20 multiple-choice questions Suggested working time: 20 minutes	
Section Two **Short answer** 50% of the total examination 6–8 short answer questions Suggested working time: 90 minutes	The candidate could be required to respond to stimuli such as short extracts from articles, tables, graphs, charts, diagrams and pictures. They could give answers to these questions in the form of dot points, short paragraphs, diagrams, tables, graphs or charts. At least one question should test the candidate's knowledge and understanding of the process of science. The questions could be scaffolded or sectionalised.
Section Three **Extended answer** 30% of the total examination Two questions from a choice of four Suggested working time: 70 minutes	Questions in this section could require the candidate to interpret, analyse or evaluate diagrams, nautical charts, graphs, scenarios or case studies, excerpts from articles, numerical data, photographs, and draw on their understanding of specific learning contexts or experiences. The questions could be scaffolded or sectionalised.

Appendix 1: Grade descriptions

Grade descriptions

Marine and Maritime Studies
Stage 1

School Curriculum and Standards Authority

A	**Investigation** Demonstrates evidence of sound research and develops designs and experiments which are generally effective in testing research questions. Investigation methods are satisfactorily recorded through diagrams, tables and graphs but labelling and graphs may have minor deficiencies. Writes reports which adhere to the correct format. Reports contain appropriate terminology and discuss data to make satisfactory inferences and conclusions.
	Practical Uses resources as directed and achieves results that meet simple design or performance requirements. Manages basic aspects of the work and/or leisure environment through hazard recognition, demonstration of safety and selection of appropriate operational procedures for working with selected equipment. Performs tasks, demonstrating all component skills with minor skill faults which are self-corrected within the allocated time.
	Response Demonstrates sound knowledge by using appropriate technical language and data, and presents information which generally includes some supporting evidence. Is able to explore alternatives and make comparisons but conclusions are briefly explained and interpreted.

B	**Investigation** Demonstrates evidence of research and develops designs and experiments which are occasionally effective in testing research questions. Investigation methods are adequately recorded through diagrams and tables but labelling may have minor deficiencies. Writes reports which generally adhere to the correct format. Reports contain some appropriate terminology, data is discussed and sound conclusions made.
	Practical With direction makes use of resources and achieves results that meet simple design or performance requirements. With minimal direction meets safety standards including the management of the work and/or leisure environment. Performs tasks with some indecisiveness leading to a number of obvious skills faults with some self-correction during additional attempts and with guidance and time.
	Response Demonstrates adequate knowledge by using appropriate technical language and data, and presents information which generally lacks supporting evidence. Explores alternatives and makes comparisons which lead to incomplete conclusions.

C	**Investigation** Demonstrates some evidence of research and develops designs and experiments which are generally not effective in testing research questions. Investigation methods are inadequately recorded. Tables, diagrams and graphs are lacking. Writes reports which loosely adhere to the correct format. Reports contain limited but appropriate terminology use; data is discussed to a limited extent and some conclusions are made.
	Practical With supervision and direction achieves results that meet simple design or performance requirements. With some direction meets safety standards including the management of the work and/or leisure environment. Performs tasks with high levels of indecisiveness leading to a number of skills faults and substandard performance, even with additional guidance and time. May require several task attempts on each task component.
	Response Demonstrates minimal knowledge by using basic technical language and data, and presents information which generally lacks supporting evidence. Has difficulty exploring alternatives and making comparisons which lead to incomplete conclusions.

Grade descriptions
Marine and Maritime Studies
Stage 1

School Curriculum and Standards Authority

D	**Investigation** Demonstrates limited evidence of research from a minimal number of sources. Investigation methods are inadequately recorded, with limited or missing explanations and representations of data. Reports are incomplete and do not adhere to the correct format and terminology use is limited.
	Practical With supervision and direction makes limited use of resources and achieves limited results that meet simple design or performance requirements. With direction meets safety standards including the management of the work and/or leisure environment. Attempts tasks with high levels of indecisiveness leading to a substantial number of obvious skills faults, unsafe practices and substandard performance, even with additional guidance and time. May require several attempts on each task component.
	Response Demonstrates little knowledge by using limited technical language and data, and presents incomplete information which lacks supporting evidence and contains inadequate conclusions.

E	**Investigation** Demonstrates little to no evidence of research. Investigation methods are not recorded and no data is presented. Reports are incomplete and do not adhere to the correct format, contain little to no terminology with no discussion of data or conclusions made.
	Practical With supervision and direction makes little to no use of resources and achieves very limited results that meet simple design or performance requirements. With direction and supervision does not meet minimal safety standards. Attempts tasks with high levels of indecisiveness and skill faults leading to very unsafe practices and substandard performance, even with additional guidance and time. Requires several task attempts on each task component.
	Response Demonstrates little to no knowledge by using little to no technical language and data and provides irrelevant conclusions.

Grade descriptions

Marine and Maritime Studies
Stage 2

School Curriculum and Standards Authority

A	**Investigation** Demonstrates evidence of detailed research that involves clear and appropriate development of designs and experiments which are effective in testing research questions. Investigation methods are clearly recorded through labelled diagrams, tables and graphs but labelling may have some deficiencies. Writes clear, detailed reports using appropriate terminology and discusses data sufficiently to make inferences and conclusions.
	Practical Independently uses a variety of resources and equipment to achieve results that meet most design or performance requirements. Manages aspects of the work and/or leisure environment through hazard recognition, demonstration of safety and selection of appropriate operational procedures for working with selected equipment. Performs tasks competently with minor skill faults which are self-corrected within the allocated time.
	Response Demonstrates detailed knowledge by using technical language and data, and presents information which generally includes supporting evidence. Is able to explore alternatives, make comparisons and conclusions are explained and interpreted.

B	**Investigation** Demonstrates evidence of sound research and develops designs and experiments which are generally effective in testing research questions. Investigation methods are adequately recorded through diagrams, tables and graphs but labelling and graphs may have some deficiencies. Writes reports which generally adhere to the correct format. Reports contain appropriate terminology and data is sufficiently discussed to make satisfactory inferences and conclusions.
	Practical Uses resources as directed and achieves results that meet some design or performance requirements. May manage the work and/or leisure environment through hazard recognition, demonstration of safety and selection of appropriate operational procedures for working with selected equipment. Performs tasks with a number of obvious skill faults which are not always self-corrected within the allocated time.
	Response Demonstrates sound knowledge by using basic technical language and data, and presents information which generally includes some supporting evidence. Is able to explore alternatives and make comparisons but conclusions are partially explained and interpreted.

C	**Investigation** Demonstrates minimal evidence of research from a limited range of sources but shows an attempt to develop designs and experiments which are occasionally effective in testing research questions. Investigation methods are insufficiently recorded and diagrams, tables and graphs are incomplete and/or lacking. Reports sometimes adhere to the correct format with some appropriate terminology use but data is not sufficiently discussed to make inferences and conclusions.
	Practical With guidance and direction makes use of resources and achieves results that meet some design or performance requirements. With direction meets safety standards including the management of the work and/or leisure environment. Performs tasks with high levels of indecisiveness leading to a substantial number of obvious skills faults and substandard performance, even with additional guidance and time.
	Response Demonstrates adequate knowledge by using basic technical language and data, and presents information which generally lacks supporting evidence. Has difficulty exploring alternatives and making comparisons which lead to incomplete conclusions.

Grade descriptions

Marine and Maritime Studies
Stage 2

School Curriculum and Standards Authority

D	**Investigation** Demonstrates limited evidence of research from a minimal number of sources. Investigation methods are inadequately recorded, with limited or missing explanations and representations of data. Reports are incomplete and do not adhere to the correct format and terminology use is limited or inappropriate.
	Practical With guidance and direction makes limited use of resources and achieves limited results that meet some design or performance requirements. With direction meets safety standards including the management of the work and/or leisure environment. Performs tasks with high levels of indecisiveness leading to a substantial number of obvious skills faults, unsafe practices and substandard performance, even with additional guidance and time.
	Response Demonstrates limited knowledge by using limited technical language and data, and presents incomplete information which lacks supporting evidence and inadequate conclusions.

E	**Investigation** Demonstrates little or no evidence of research. Investigation methods are not recorded and data is missing. Reports are incomplete and do not adhere to the correct format and contain little or no terminology.
	Practical With guidance and direction makes little or no use of resources and achieves very limited results that meet some design or performance requirements. With direction and supervision meets minimal safety standards. Attempts tasks with high levels of indecisiveness and skill faults leading to unsafe practices and substandard performance, even with additional guidance and time.
	Response Demonstrates little or no knowledge by using little or no technical language and data and provides irrelevant conclusions.

Grade descriptions

Marine and Maritime Studies
Stage 3

School Curriculum and Standards Authority

A	**Investigation** Demonstrates evidence of extensive research that involves accurate development of designs and experiments which effectively test research questions. Investigation methods are clearly recorded through correctly labelled diagrams, tables and graphs. Writes clear, detailed reports using appropriate terminology and referencing making valid comprehensive inferences, justifications and conclusions which identify meaningful recommendations.
	Practical Independently uses an extensive variety of resources and equipment to achieve results that meet design or performance requirements. Manages the work and/or leisure environment through hazard recognition, demonstration of safety and selection of appropriate operational procedures. Performs tasks fluently with negligible discrepancies from defined standards within the allocated time. Demonstrates elevated levels of responsibility.
	Response Demonstrates current and accurate knowledge of the field by using accurate technical language and data, and is able to explore alternatives, justify comparisons, interpretations and conclusions.

B	**Investigation** Demonstrates detailed evidence of sound research that involves clear but not always accurate development of designs and experiments which are generally effective in testing research questions. Investigation methods are clearly recorded through labelled diagrams, tables and graphs but labelling may have some deficiencies. Writes clear, detailed reports using appropriate terminology and discusses data sufficiently to make inferences and conclusions.
	Practical Independently uses a variety of resources and equipment to achieve results that meet most design or performance requirements. Manages aspects of the work and/or leisure environment through hazard recognition, demonstration of safety and selection of appropriate operational procedures for working with selected equipment. Performs tasks competently with minor skill faults which are self-corrected within the allocated time.
	Response Demonstrates knowledge of the field by using technical language and data, and presents information which sometimes lacks supporting evidence. Is able to explore alternatives, make comparisons but conclusions are partially explained and interpreted.

C	**Investigation** Demonstrates minimal evidence of research from a limited range of sources but shows an attempt to develop designs and experiments which are occasionally effective in testing research questions. Investigation methods are adequately recorded through simple diagrams, tables and graphs but labelling and graphs may have some deficiencies. Writes reports which contain some appropriate terminology and does not discuss data sufficiently to make inferences and conclusions.
	Practical Uses resources as directed and implements plans and achieves results that meet some design or performance requirements. May manage the work and/or leisure environment through hazard recognition, demonstration of safety and selection of appropriate operational procedures for working with selected equipment. Performs tasks with a number of obvious skill faults which are not always self-corrected within the allocated time.
	Response Demonstrates adequate knowledge of the field by using basic technical language and data, and presents information which generally lacks supporting evidence. Has difficulty exploring alternatives and making comparisons which lead to incomplete conclusions.

Grade descriptions
Marine and Maritime Studies
Stage 3

School Curriculum and Standards Authority

D	**Investigation** Demonstrates limited evidence of research. Investigation methods are inadequately recorded and explained. Representations of data are limited or missing and reports are incomplete and terminology use is limited.
	Practical With guidance and direction makes limited use of resources and demonstrates limited implementation of plans and design or performance requirements. With direction meets safety standards including the management of the work and/or leisure environment. Performs tasks with high levels of indecisiveness leading to a substantial number of obvious skills faults and substandard performance, even with additional guidance and time.
	Response Demonstrates limited knowledge of the field by using limited technical language and data, and presents incomplete information which lacks supporting evidence and contains inadequate conclusions.

E	**Investigation** Demonstrates little or no evidence of research. Investigation methods are not recorded and data is missing. Reports contain little or no terminology and explanation and are incomplete.
	Practical With guidance and direction makes little or no use of resources. With direction and supervision meets minimal safety standards. Attempts tasks with high levels of indecisiveness and skill faults leading to unsafe practices and risk.
	Response Demonstrates little or no knowledge of the field by using little or no technical language and data and provides irrelevant conclusions.